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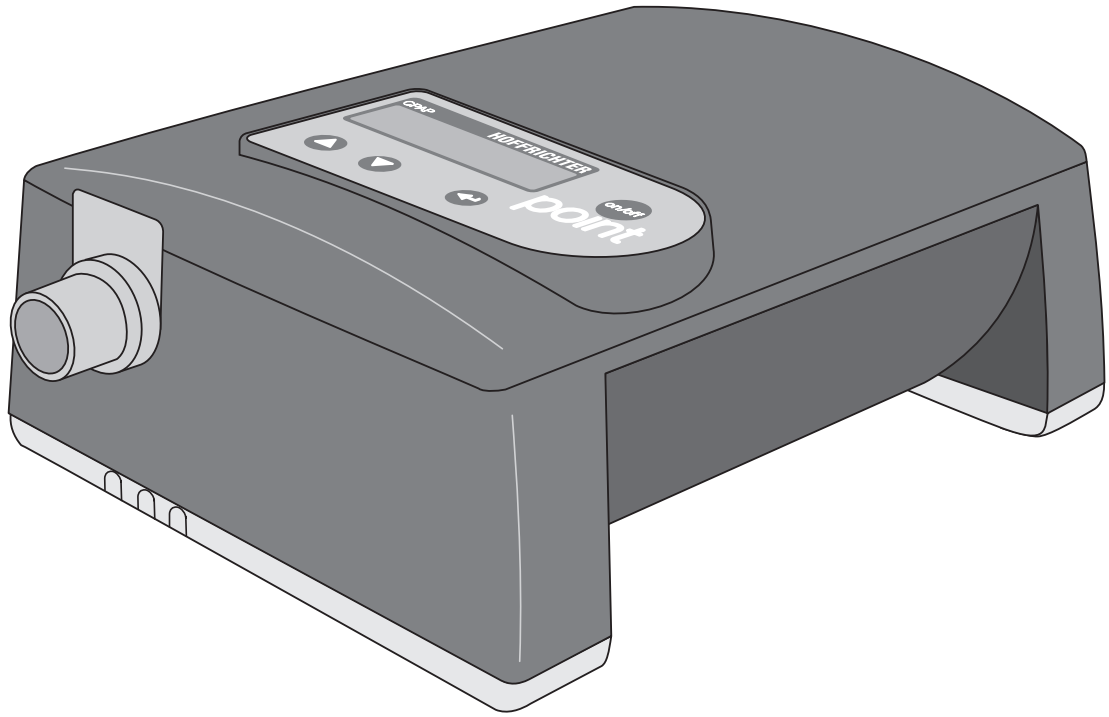
point



Service Manual

CPAP Respiratory Therapy Device

from serial number J10B5432 to J10E106064

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1 SYMBOLS IN SERVICE MANUAL

Important information is denoted by symbols in this service manual. Be sure to follow these instructions in order to avoid accidents, personal injury and material damage.

In addition, the local accident prevention regulations and general safety regulations in force in the area of use must be observed.

This symbol denotes general safety instructions. Follow these instructions to avoid accidents, personal injury or material damage.

⚠CAUTION

This symbol denotes hazardous situations that may lead to moderately severe injuries.

NOTICE

This symbol denotes situations that may lead to material damage or damage to the device.

IMPORTANT

This symbol denotes information, tips and instructions for the effi cient, error-free use of the device.

2 SAFETY INFORMATION

- Before starting maintenance, read this service manual through carefully.
- There is a risk of short-circuiting due to the capacitors present in the device (including when de-energized). When servicing is performed at the patient's home, the patient should be warned of the risk.
- Repair and maintenance may only be carried out by qualified, authorized and competent specialist personnel.
- This manual refers solely to the point respiratory therapy device. It does not deal with accessories such as therapy tubing and masks.
- If an accessory is suspected of being defective, it should be visually inspected by the service technician and the result recorded in the servicing report.
- For hygiene reasons, we recommend wearing disposable gloves whenever working on the device. Before further work, the device must be subjected to wipe disinfection with a standard disinfectant solution.
- When new goods are received by the Service department, the documents supplied with the device must be checked. Devices contaminated are prepared according to the point hygiene concept.

3 PREPARATION OF DEVICES WHEN CHANGING PATIENT

The hygienic preparation of a device during a patient change can be carried out using a mechanical procedure based on the hygiene concept. The type and scale of the preparation are described in detail in this concept. The number of preparation cycles is not limited.

4 DESCRIPTION OF DEVICE

4.1 HOUSING, DISPLAY AND CONTROL ELEMENTS

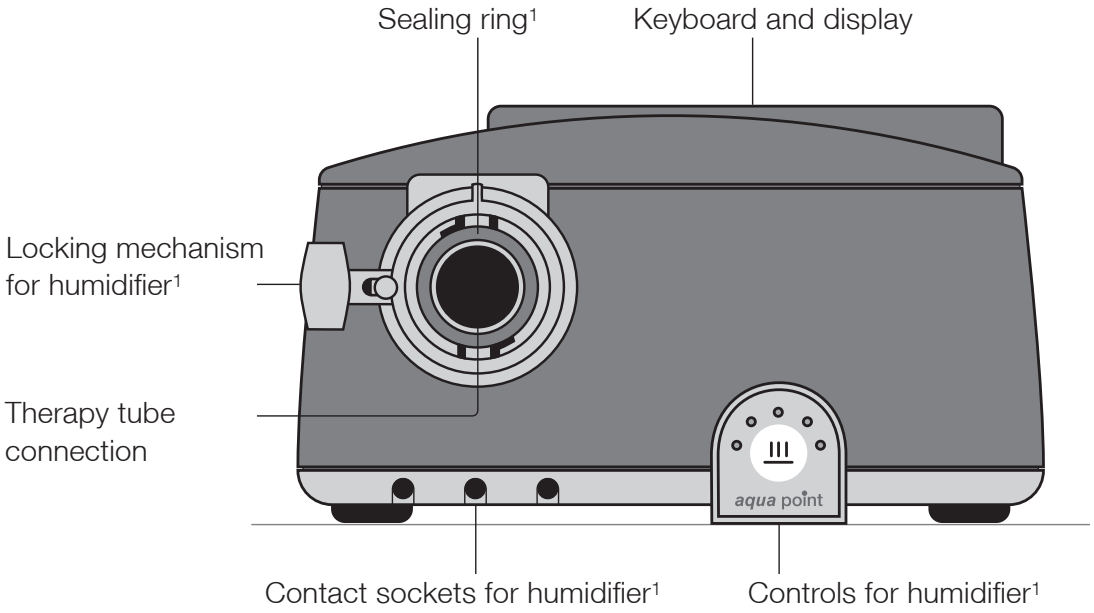

Figure 1: Front view of device

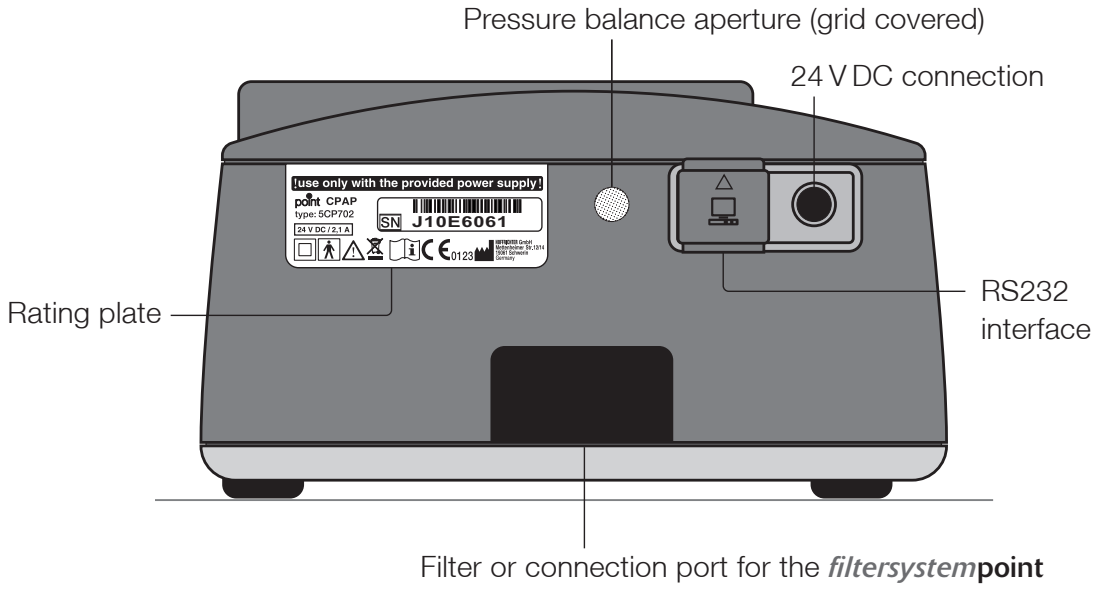

Figure 2: Rear view of device

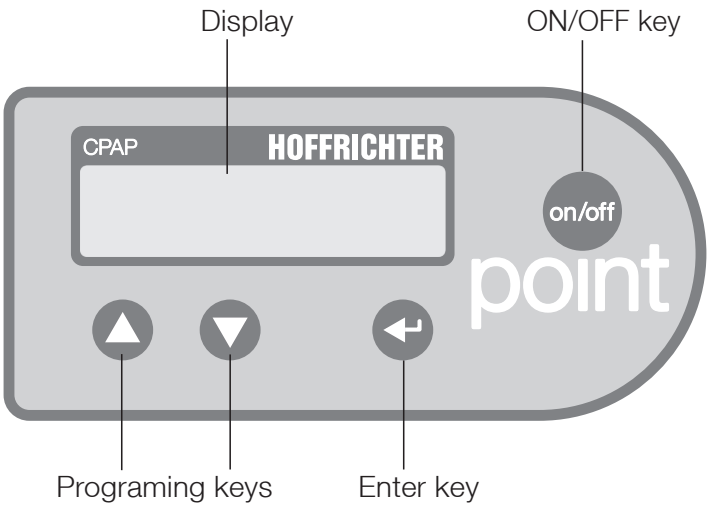

Figure 3: Keyboard and display

1 optional equipment version

4.2 CONTROLLER CIRCUIT BOARD V3.0

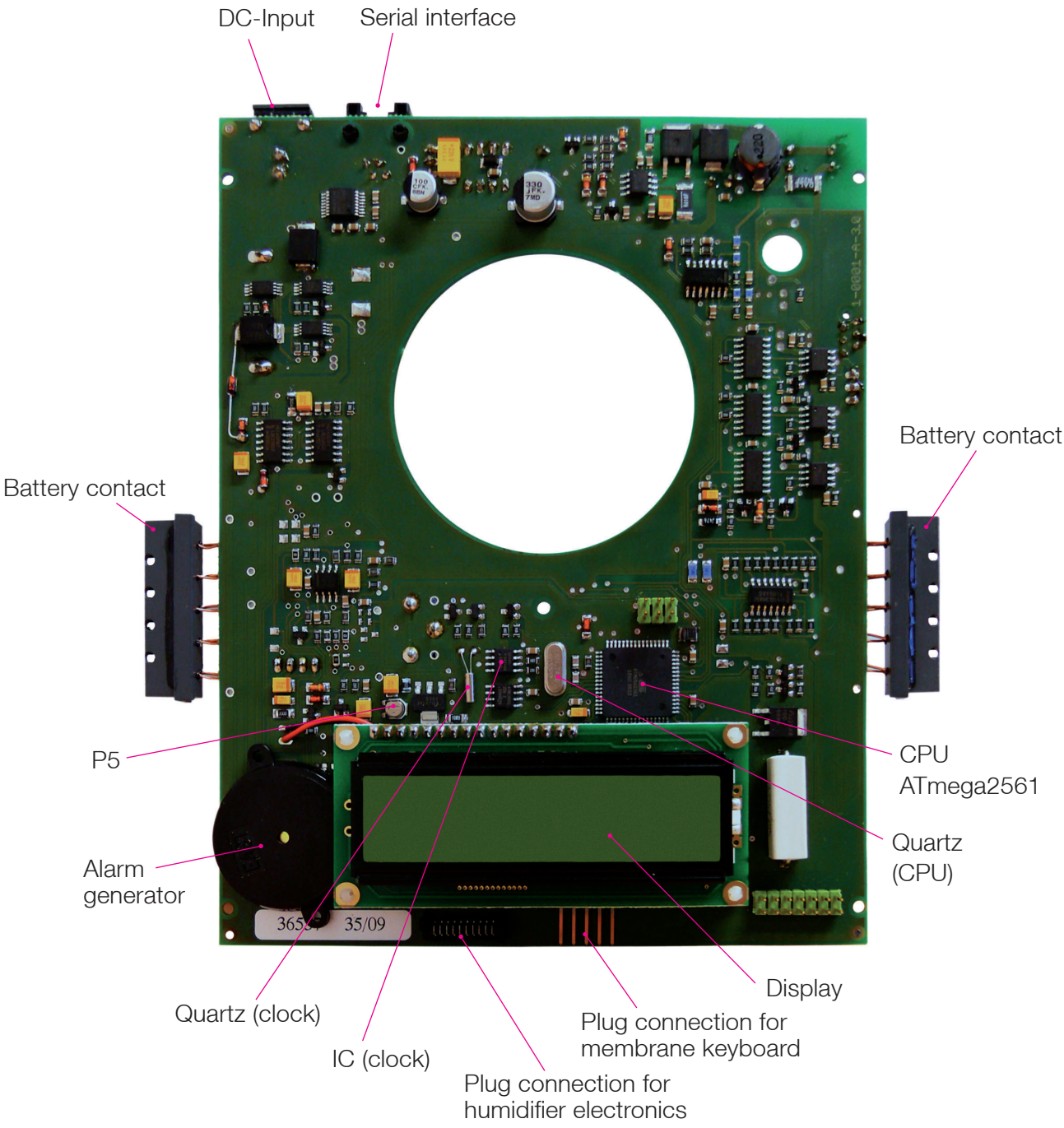

Figure 4: Controller (solder side)

IMPORTANT
The controller circuit boards V2.0 and V 3.0 are functionally identical. Only the mounting architecture and the plug connector for the humidifier electronics are different constructed.

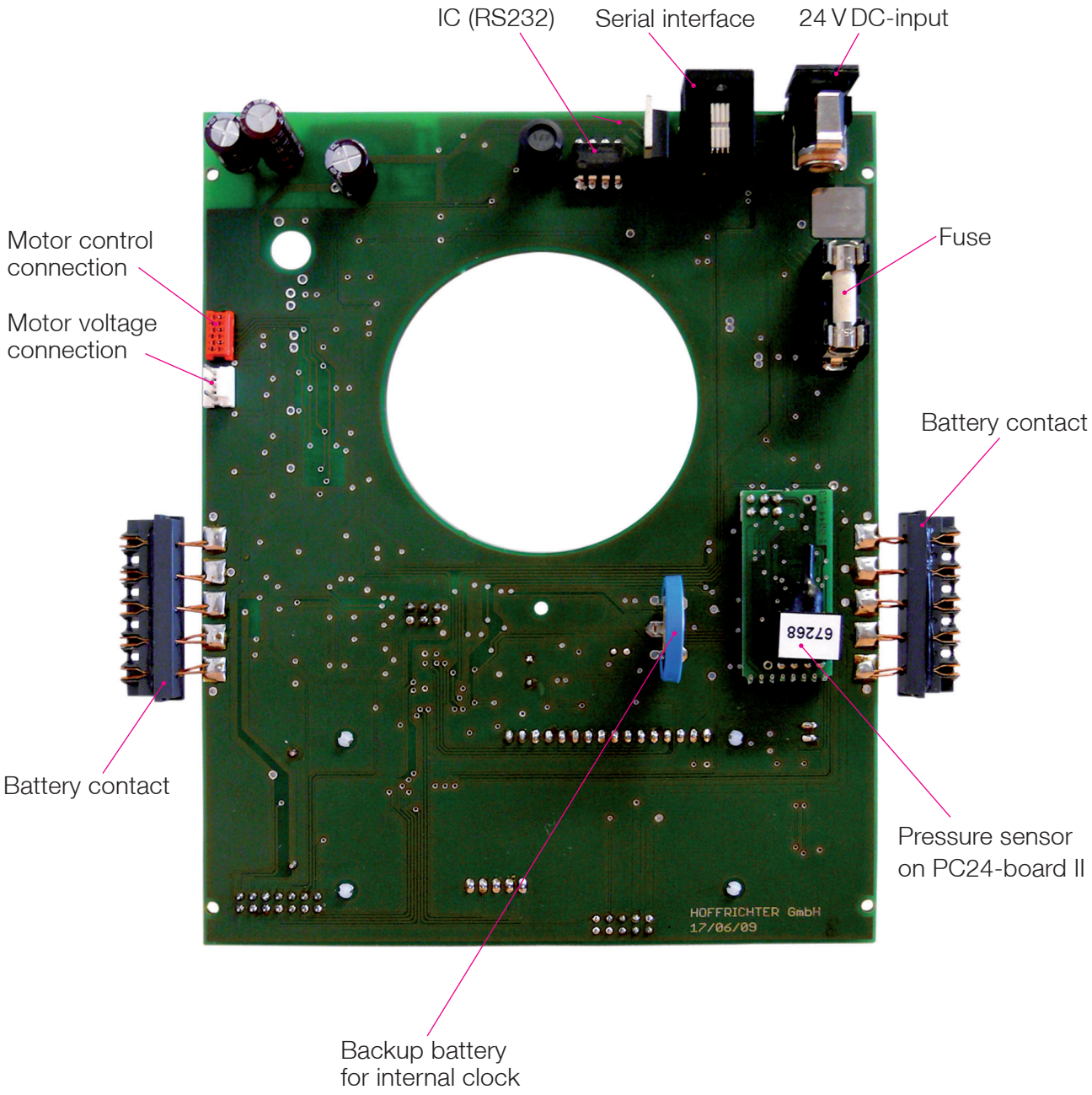

Figure 5: Controller (component side)

5 TECHNICAL EXPLANATIONS

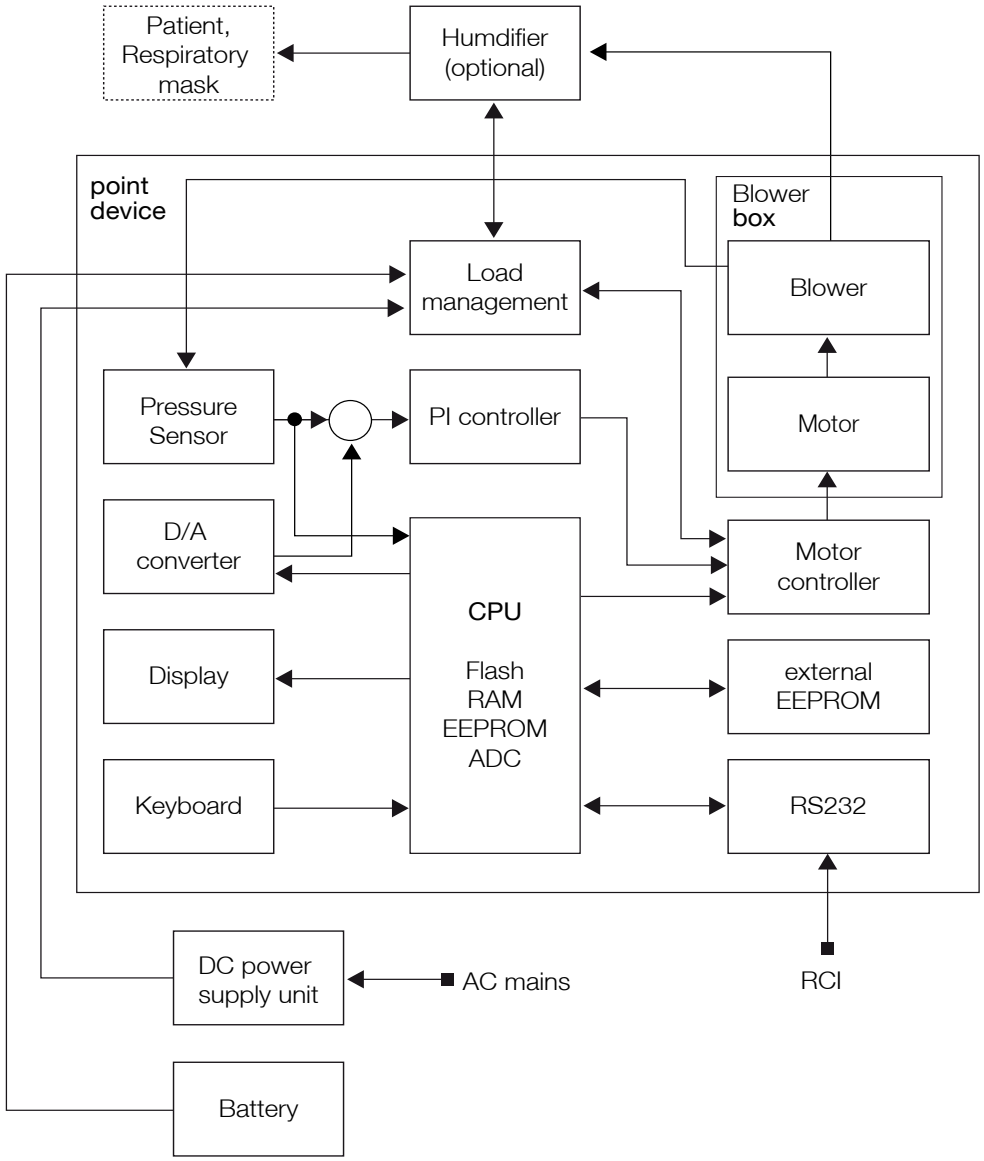

Figure 6: Block diagram

Heating (optional when humidifier is connected)

The humidifier heating consists of a heating element in the electronic unit of the humidifier. The heating capacity can be set to 5 different heating levels using the controls.
The maximum temperature of the heating plate is limited to 60 °C. In addition, there is a thermal fuse in the electronic unit of the humidifier, which trips at a temperature of 135 °C in the event of a fault.

Power supply

The device is operated via an external switched-mode power supply with a wide input range of 100 - 240 V AC and a frequency of 50 - 60 Hz.
No maintenance or repairs should be performed on the switched-mode power supply.

Motor control

A piezoelectric sensor (differential pressure measuring procedure, measuring range: 0 ... 3500 Pa) continuously measures the actual output pressure. The setpoint pressure value is output by the computer. The difference between these two values is corrected by the PI controller and the motor control. Switching controllers are used to minimize power losses.

Motor

DC motor, operating voltage 4 - 24 V, electronically commutated
Adjustment range: 7.0 - 17.5 V DC

point processor (ATmega2561)

The ATmega 2561 processor is a microcontroller which is used in all point devices. The key technical data include:

- 256 Kbyte flash memory
- 4 Kbyte EEPROM memory
- 8 Kbyte RAM
- programmable interface
- an integrated A/D converter (10 bit)
- 54 programmable I/O pins

Clock

The point has a real-time clock. The real-time clock is supplied by an internal battery (CR2032), which offers an operating time of 8 to 10 years.

Alarm

Output of an acoustic alarm for wake-up function as well as in the case of absent or excessive mask pressure.

6 TOOLS AND MEASURING EQUIPMENT

The following equipment is required for servicing:

- Service manual and maintenance documents
- Battery pack (***powerpack*point**) or point power supply unit
- Screwdriver (Phillips and slotted) in various sizes
- Soft brush and Service vacuum cleaner
- Soft base
- Auxiliary tool (art. no. 00007939)
- Therapy tube
- Flow resistor (art. no. 00007303)
- RS232 adapter cable (Sub-D9 / RJ45 art. no. 00005232)
- Device for testing electrical safety (e.g. SECUTEST SIII/DIN EN 62353:2008)
- PC with following system requirements:
  - MS Windows® 98, 2000, NT4.0, ME, XP, Server 2003, Vista or 7
  - AMD Athlon/Pentium class (x86), clock frequency 700 MHz
  - min. 192 MB system memory for MS Windows® 98, NT4.0, ME
  - min. 400 MB system memory for MS Windows® 2000, XP, Server 2003, Vista
  - min. 150 MB free hard drive space (or more depending on the required storage capacity for patient files)
  - min. 280 MB free hard drive space for the Microsoft .NET Framework 2.0 Redistributable (x86)
  - 2 MB graphics card min. High Color (16 bit)
  - Mouse
  - 1 free COM interface per device
  - 1 free SD interface (only when using DATA box)
- HOFFRICHTER TRENDset PC software
- Spray disinfectant (e.g. Mikrozid® Liquid)

7 OPENING THE DEVICE

⚠CAUTION
To protect against germs the surface of the device and, where present, the humidifier must be treated with a disinfectant immediately after unpacking.

1. Unplug the mains plug.
2. Remove the filter or the filter system ***filtersystem*point** (optional).
3. Remove the humidifier, where present.
4. Remove the two batteries (***powerpack*point**), where present.
5. Place the device top down on a soft base.
6. Open the device as follows:
   a. Remove the feet of the housing.
   b. If the point is set up for the connection of a humidifier, remove the control electronics of the humidifier and disconnect the plug connection.
   c. Release the four screws at the housing.
   d. Dismantle the upper casing of the housing.
6. Disconnect the plug connection and the pressure measuring connection.
7. Carefully remove the heating cable (using aids if necessary).

8 SERVICING HARDWARE

8.1 CLEANING

1. Clean the inside of the device carefully using the brush and the Service vacuum cleaner.
2. Remove heavy soiling using a damp cloth.
3. Perform spray disinfection on all components acting as air ducting.
4. If a humidifier is present, wash out the water container and perform spray disinfection on it. Apply a 5 % solution of vinegar to stubborn limescale.

8.2 FILTER

Replace the filter with a new one. When using the optional filter system (***filtersystem*point**), replace the filter inserts.

8.3 CHECKING HEATING CABLE

1. Check that the heating cable is still intact (insulation) and that the plug connections are not bent.
2. The heating cable should be protected from tension, compression and clamping.

8.4 CHECKING PLUG CONNECTIONS

Check all plug connections on the controller circuit board for secure positioning and, where necessary, correct deficiencies.

NOTICE
The device is energized during the following operations!

8.5 CHECKING FUNCTION OF DISPLAY

1. Connect the device to the power supply.
2. Check whether all characters are shown completely and correctly in the display.

8.6 CHECKING DISPLAY CONTRAST

1. Press any key. The display lights up with a brightness of 100 %.
2. The background of the display is illuminated. The display should be clearly legible in daylight.
3. After 15 seconds the display fades to 50 % of the brightness level.
4. The display should now be faint, yet still clearly legible.
5. If required, the display contrast can be adjusted with P5 (see Figure 4 on page 6).

8.7 CHECKING KEY FUNCTIONS

1. Check that the turbine switches on and off properly when the ON/OFF key is pressed.
2. Check whether the menu can be operated properly using the arrow keys.

8.8 CHECKING FOR SECURE ATTACHMENT OF CONTROLLER CIRCUIT BOARD

Check whether the controller circuit board is properly secured and in the correct position.

9 CLOSING THE DEVICE

1. Unplug the mains plug.
2. Position the motor cable in the space between the motor and the wall of the housing and run the heating cable between the box and the wall of the housing.
3. Position the pressure measuring tube above the controller circuit board and connect it to the pressure sensor.
4. Carefully fit the upper case of the housing, making sure that no cables or tubes are compressed or crushed.
5. Place the device upright again and screw the upper and lower casing together. Then reattach the housing feet.
6. If the point was set up for the connection of a humidifier, install the controls and the control electronics of the humidifier.
7. Insert the filter or fit the ***filtersystem*point** filter system (optional).

10 CHECKING ELECTRICAL SAFETY

The point basic device is equipped with protective insulation and does not have any exposed electrically conductive parts at the housing. As such, electrical safety testing of the device is not included.
Electrical safety testing is only possible on the power supply unit and is performed by a device safety tester (e.g. SECUTEST SIII), which complies with the DIN EN 62353:2008 standard. The reference point is the ground conductor on the secondary side of the power supply unit (external contact).

11 SERVICING SOFTWARE

11.1 VALIDATION OF SETTINGS

1. Connect the device to the PC using the adapter cable (art. no. 00005232).
2. Insert the power supply unit and connect it to the device.
3. Start the TRENDset PC software.
4. Compare the settings with the medical prescription, the patient ID card, etc.
5. Correct the values if necessary.

11.2 SERVICE AND ANALYSIS

1. Connect the therapy tube.
2. Insert the flow resistor (art. no. 00007303) into the other end of the therapy tube.
3. Disable the softstart ramp and the mask test in the complete menu of the device or using TRENDset.
4. Log in to TRENDset under “Settings / Service / Log in”.
5. Enter “service” as the Username.
6. Enter “user140372” as the Password.
7. Select the view “Times and Counters”.
8. Set the Service counter to the next maintenance interval.
9. Correct the date and time if necessary.
10. Select the menu item “ADU Test”.

11. Start measurement.
12. The entire pressure range is now checked for pressure deviations. The maximum deviation must not exceed ± 0.5 hPa. If the maximum deviation is exceeded, send the device in to your distributor for checking.
13. Close the “ADU Test” window.

12 FINAL STEPS

After finishing servicing, draw up a final report and affix a test seal showing the date and tester’s initials to a suitable position on the device.

13 SPARE PARTS LIST

Device

Designation	Article no.
Power supply unit, 2-pin	0000 2020
Power supply cable	3110 0015
Carrier bag	0000 2111
Standard coarse filter 45 x 25 x 7 mm	0000 2110
Therapy tube without measuring tube	0000 7875
Plastic ring (air outlet)	4210 0714
Blower	4100 0109
Controller circuit board without heating cable	0000 5412
Display	1520 0012
Heating cable assembled, SN J10B5432 - J10C5769 or higher, Controller V2.0	0000 5239
Heating cable assembled, J10C5770 or higher, Controller V3.0 and V8.0	0000 5238
Battery CR2032	1600 0011
Ceramic microfuse 2.5 A	2400 0020
Battery contact for ***powerpack*point** battery pack	0000 2230
Upper casing	0000 5666
Plastic foil keyboard	2200 0096
Air outlet	4210 0728
Bellow air outlet	4210 0713
Cover (instead of control electronic ***aqua*point**)	4210 0708
Clamp (meander)	4210 0715
Noise absorber	4210 0711
Blind DC input, PC interface	4210 0724
Blind DC input, PC interface	4210 0720
Foot for housing	4210 0719

Tab. 1: Spare parts list for device

Humidifier

Designation	Article no.
***aqua*point** humidifier incl. control electronic, locking mechanism and sealing ring	0000 7949
Control electronic for ***aqua*point** humidifier	0000 4286
Locking mechanism for ***aqua*point**	0000 2361
Sealing ring (air outlet) for ***aqua*point**	4210 0727
Water container with heating plate	0000 4283
Closing cap	4210 0701
Air guide	4210 0703

Tab. 2: Spare parts list for humidifier

Battery pack

Designation	Article no.
***powerpack*point** battery pack (2 pcs.)	0000 7846

Tab. 3: Spare parts list for battery pack

Filter system

Designation	Article no.
Filter system ***filtersystem*point** with coarse and fine filter, ready for use	0000 7847
Filter cassette for filter system ***filtersystem*point** without filter	4210 0729
Fine filter for filter system ***filtersystem*point**	00002109
Coarse filter for filter system ***filtersystem*point**	0000 2108

Tab. 4: Spare Parts List for Filter System

14 DISPOSAL

Proper disposal saves natural resources and prevents harmful substances being released into the environment.

14.1 DEVICE

The device must not be disposed of with the household waste. Please contact the manufacturer to find out how to dispose of the device, etc. properly.

14.2 PACKAGING

The packaging is taken back by the manufacturer but it can alternatively be disposed of separately with the normal household waste.

14.3 BATTERIES

Exchanged batteries must be recycled in accordance with battery regulations. Please contact the manufacturer to find out how to dispose of the batteries properly.

HOFFRICHTER GmbH
Mettenheimer Straße 12/14
19061 Schwerin
Germany
Telefon: +49 385 39925-0
Telefax: +49 385 39925-25
E-Mail: info@hoffrichter.de
www.hoffrichter.de

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